MOSFET

146A,40V,3.5 mΩ,N-CHANNEL MOSFET

Features

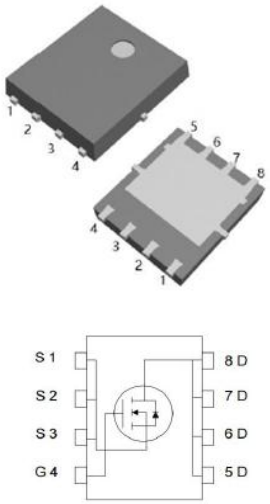
- Extremely low on-resistance $R_{DS(on)}$
- Fast switching
- Excellent Low Ciss
- Low gate charge

Applications

- Load Switch
- PWM Application
- Power Management

View and Internal Schematic Diagram

PDFN5*6-8L



Parameter	Values	Unit
BV_{DSS}	40	V
I_D	146	A
R_{Dson}(max)	3.5	mΩ
$V_{GS(th)}$(Typ)	2.7	V

Ordering Code	Marking	Package	Packaging
X3P5N040THV8	X3P5N040THV8	PDFN5*6-8L	Tape & Reel

Absolute Maximum Ratings(T_C=25℃,unless otherwise noted)

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Drain-Source Voltage	V_{DSS}	-	-	40	V	-
Gate-Source Voltage	V_{GS}	-25	-	25	V	-
Continuous Drain Current(Note 1)	I_D	-	-	146	A	T_C=25℃
				92	A	T_C=100℃
Pulsed Drain Current(Note 2)	I_{DM}	-	-	584	A	-
Single Pulse Avalanche Energy	E_{AS}	-	-	552	mJ	L=0.5mH,V_D=32V, T_C=25℃
Maximum Power Dissipation	P_D	-	-	135	W	T_C=25℃
				2.6	W	T_A=25℃
Operating Junction and Storage Temperature Range	T_j,T_{STG}	-55	-	150	℃	-

Thermal Characteristics

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Thermal resistance , junction to Case	$R_{th(J-c)}$	-	0.92	-	℃/W	-
Thermal resistance , junction to Ambient	$R_{th(J-a)}$	-	48	-		-

Electrical Characteristics (T_j=25℃,unless otherwise noted)

Static characteristics

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Drain-Source Breakdown Voltage	BV_{DSS}	40	-	-	V	V_{GS}=0V,I_D=250μA
Zero Gate Voltage Drain Current	I_{DSS}	-	-	1	μA	V_{DS}=40V,V_{GS}=0V
Gate-Body Leakage Current,Forward	I_{GSSF}	-	-	100	nA	V_{GS}=25V,V_{DS}=0V
Gate-Body Leakage Current,Reverse	I_{GSSR}	-	-	-100	nA	V_{GS}=-25V,V_{DS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	2	-	4	V	V_{DS}=V_{GS},I_D=250μA
Drain-Source On-State Resistance	$R_{DS(on)}$	-	2.9	3.5	mΩ	V_{GS}=10V,I_D=30A
Gate Resistance	R_g	-	1.8	-	Ω	V_{GS}=0V, V_{DS}=0V, f=1MHz
Forward Transconductance	g_{fs}	-	25	-	S	V_{DS}=10V,I_D=30A

Dynamic characteristics

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Input Capacitance	C_{iss}	-	4576	-	pF	V_{DS}=20V,V_{GS}=0V,f=1.0MHZ
Output Capacitance	C_{oss}	-	475	-	pF	
Reverse Transfer Capacitance	C_{rss}	-	359	-	pF	
Turn-On Delay Time	$t_{d(on)}$	-	26	-	ns	V_{DD}=20V, V_{GS}=10V, R_G=3Ω, I_D=20A
Turn-On Rise Time	t_r	-	85	-	ns	
Turn-Off Delay Time	$t_{d(off)}$	-	57	-	ns	
Turn-Off Fall Time	t_f	-	35	-	ns	

Gate charge characteristics

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Total Gate Charge	Q_g	-	88	-	nC	V_{DS}=20V,I_D=30A,V_{GS}=10V
Gate-Source Charge	Q_{gs}	-	26	-	nC	
Gate-Drain Charge	Q_{gd}	-	17	-	nC	

Reverse diode

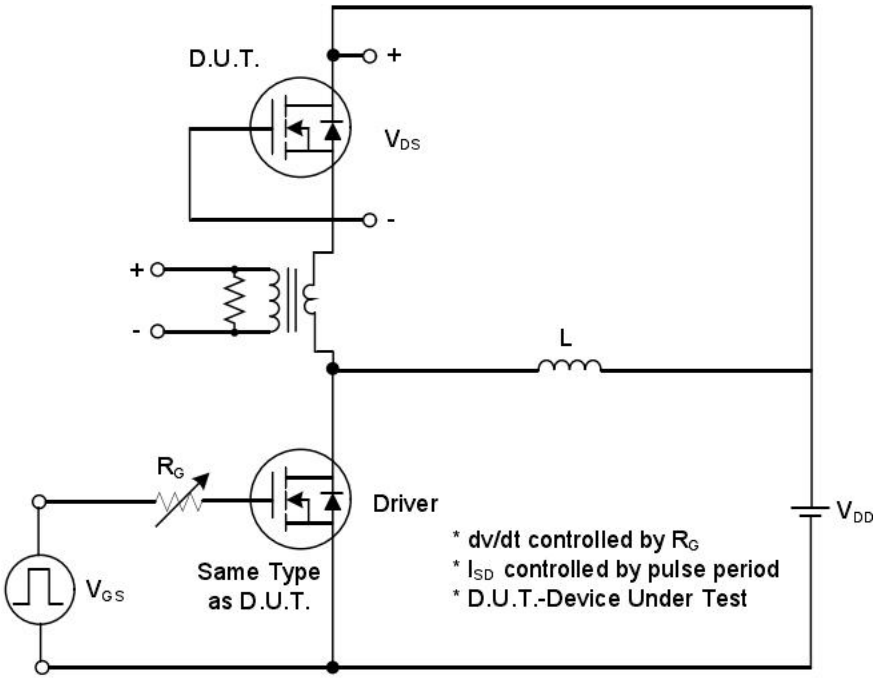
Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Continuous Diode Forward Current	I_S	-	-	146	A	-
Pulsed Diode Forward Current	I_{SM}	-	-	584	A	-
Diode Forward Voltage	V_{SD}	-	-	1.2	V	I_S=30A,V_{GS}=0V
Reverse Recovery Time	t_{rr}	-	4	-	ns	V_{GS}=0V,I_S=30A,
Reverse Recovery Charge	Q_{rr}	-	1	-	nC	di/dt=100A/μs

Notes

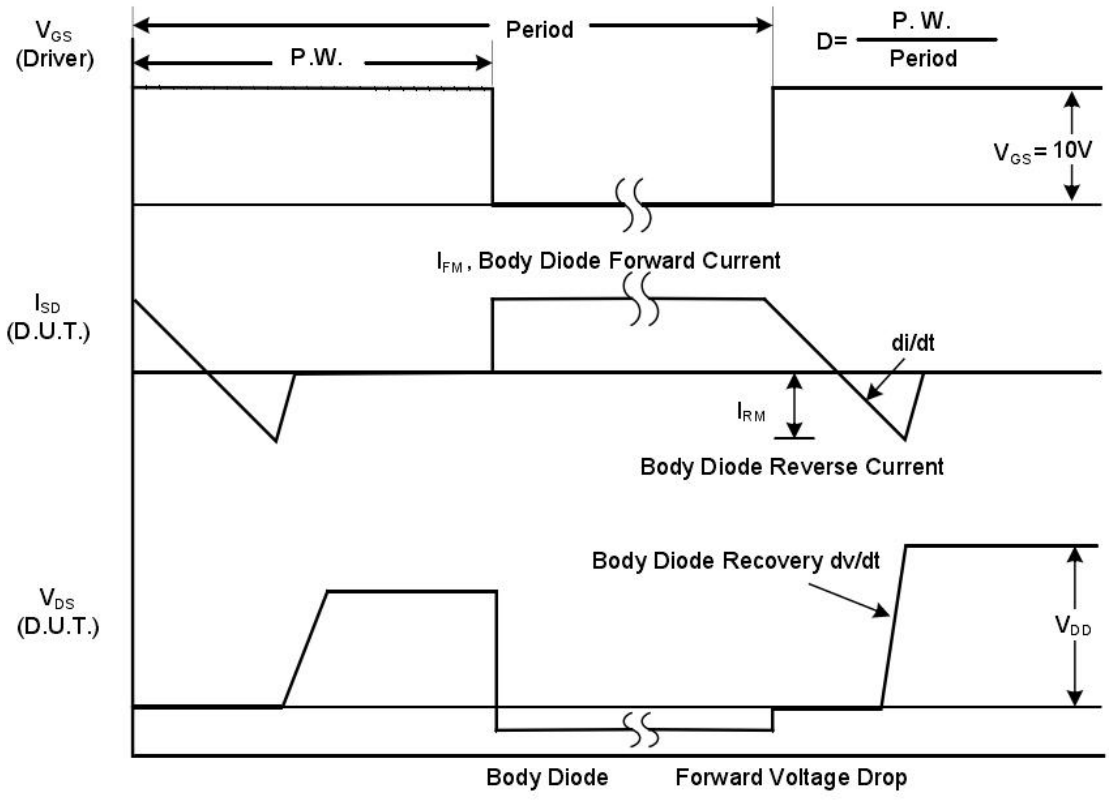
1. Computed continuous current assumes the condition of T_{j_Max} while the actual continuous current depends on the thermal & electro-mechanical application board design.

2.This single-pulse measurement was taken under T_{j_Max} = 150°C.

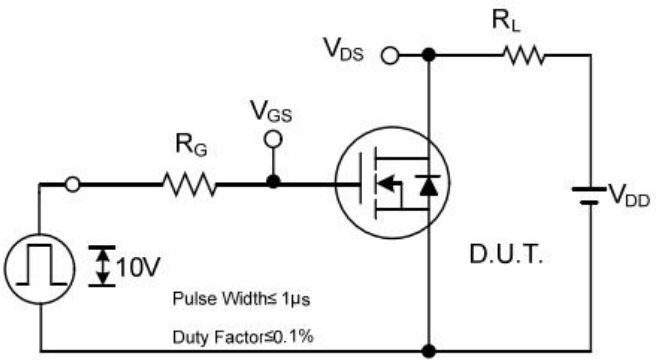
RATING AND CHARACTERISTIC CURVES



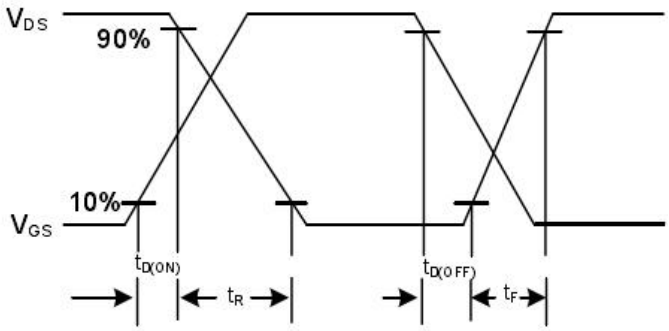
Peak Diode Recovery dv/dt Test Circuit



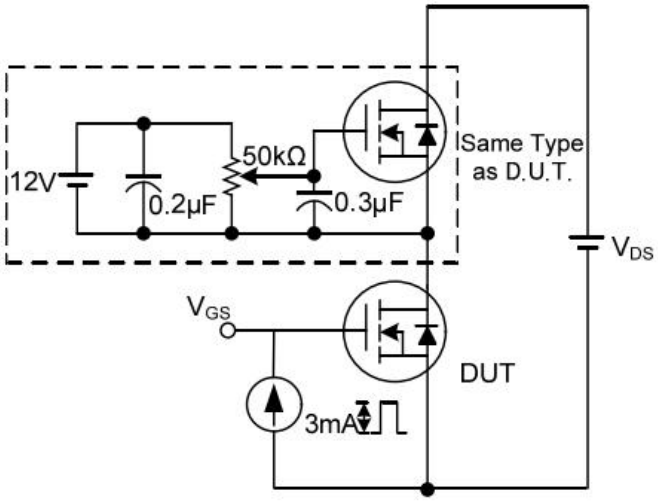
Peak Diode Recovery dv/dt Waveforms



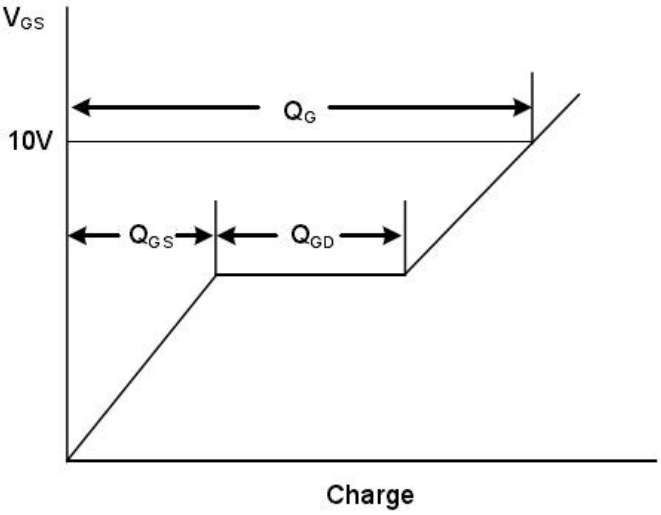
Switching Test Circuit



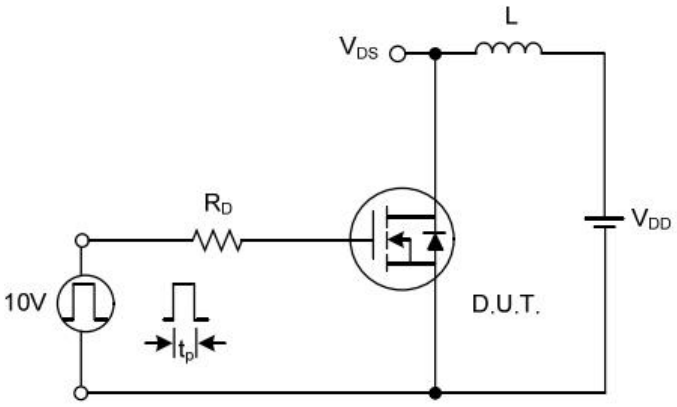
Switching Waveforms



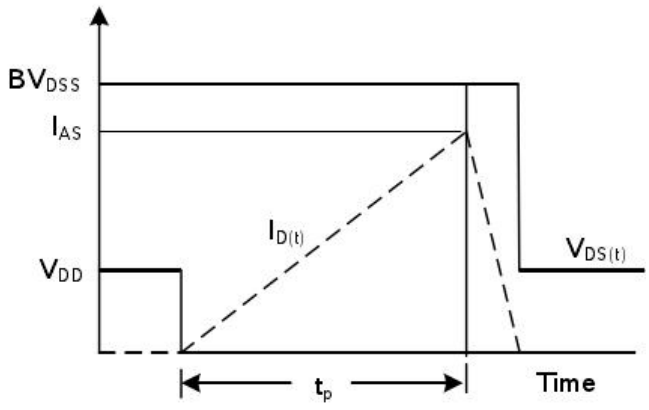
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

RATING AND CHARACTERISTIC CURVES

Figure.1 Output Characteristics T_j=25℃

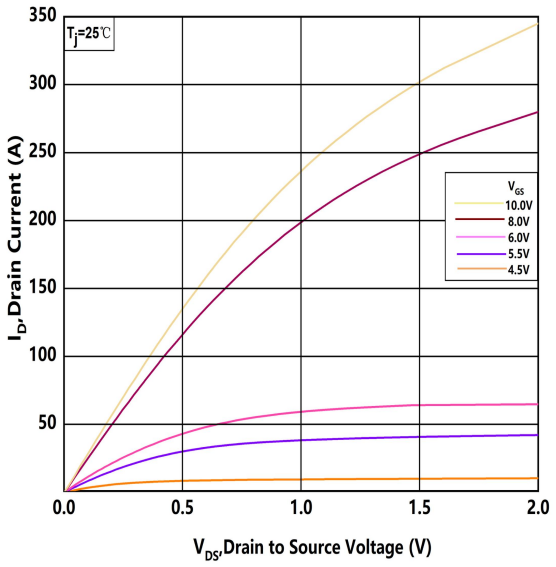


Figure.2 Transfer Characteristic for Various Junction Temperatures

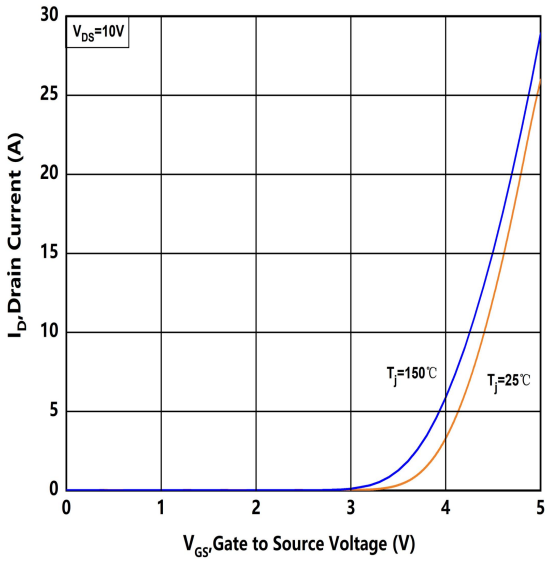


Figure.3 On-Resistance vs Drain Current For Various Gate Voltage

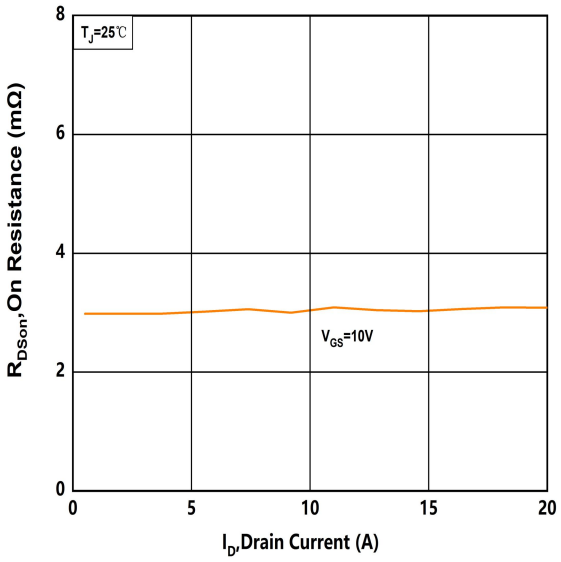


Figure.4 Typical On-Resistance vs Junction Temperature

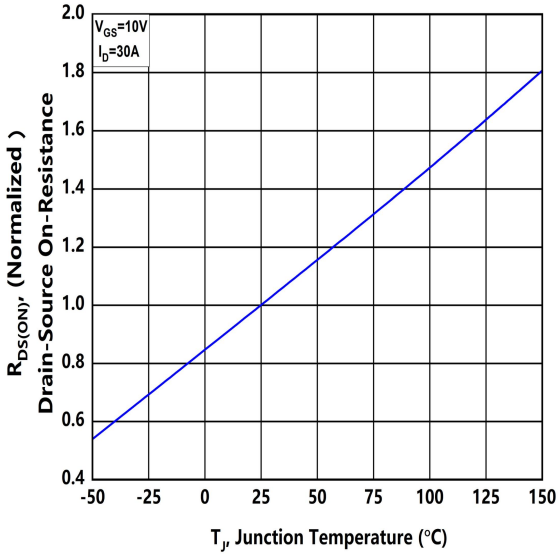


Figure.5 Typical Threshold Voltage vs Junction Temperature

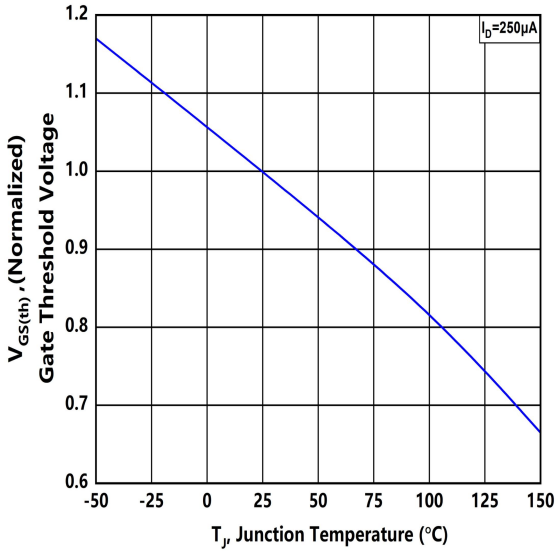


Figure.6 Typical Breakdown Voltage vs Junction Temperature

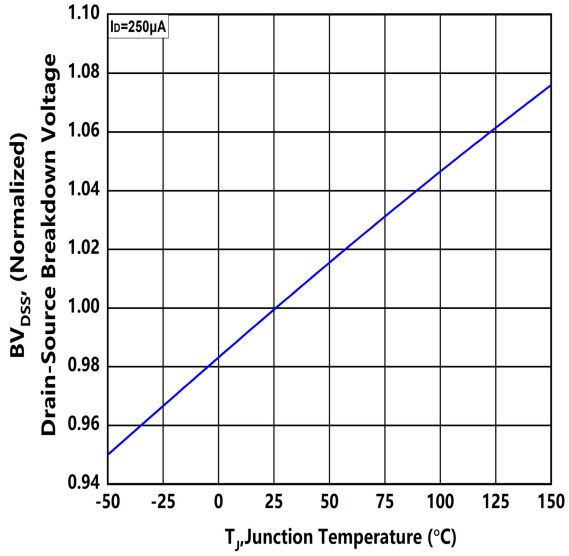


Figure.7 Typical Capacitance vs Drain to Source Voltage

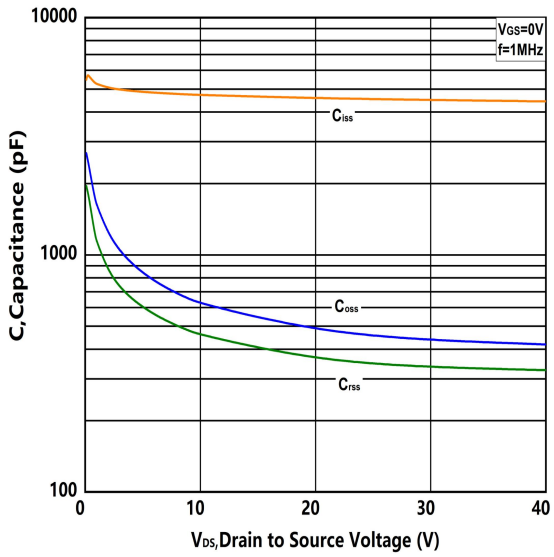


Figure.8 Typical Gate Charge vs Gate to Source Voltage

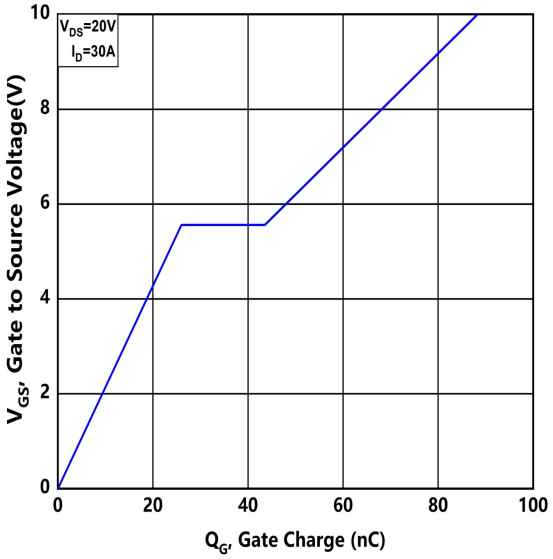


Figure.9 Typical Body Diode Characteristics

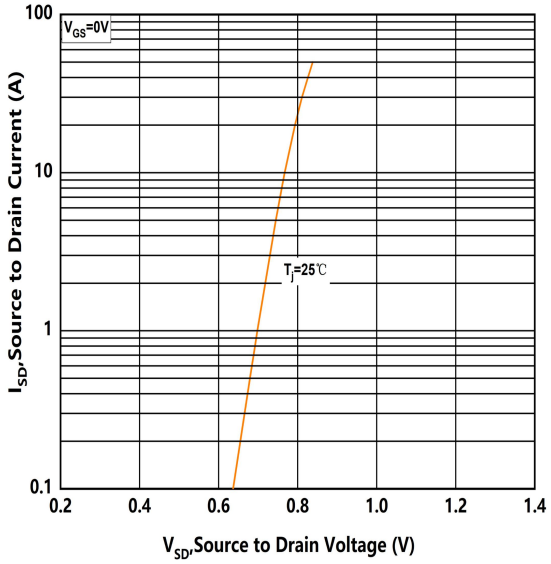


Figure.10 Maximum power Dissipation Derating vs Case Temperature

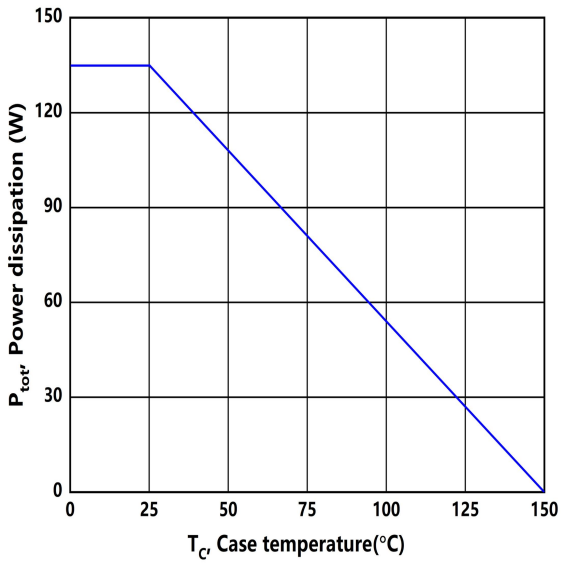


Figure.11 Continuous Drain Current Derating vs Case Temperature

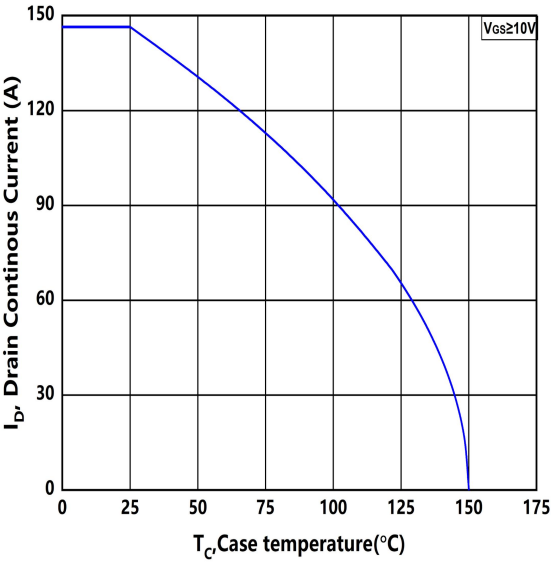


Figure.12 Safe Operating Area

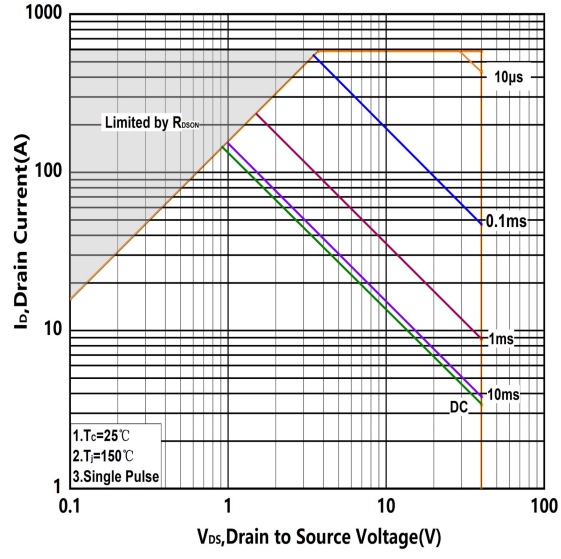
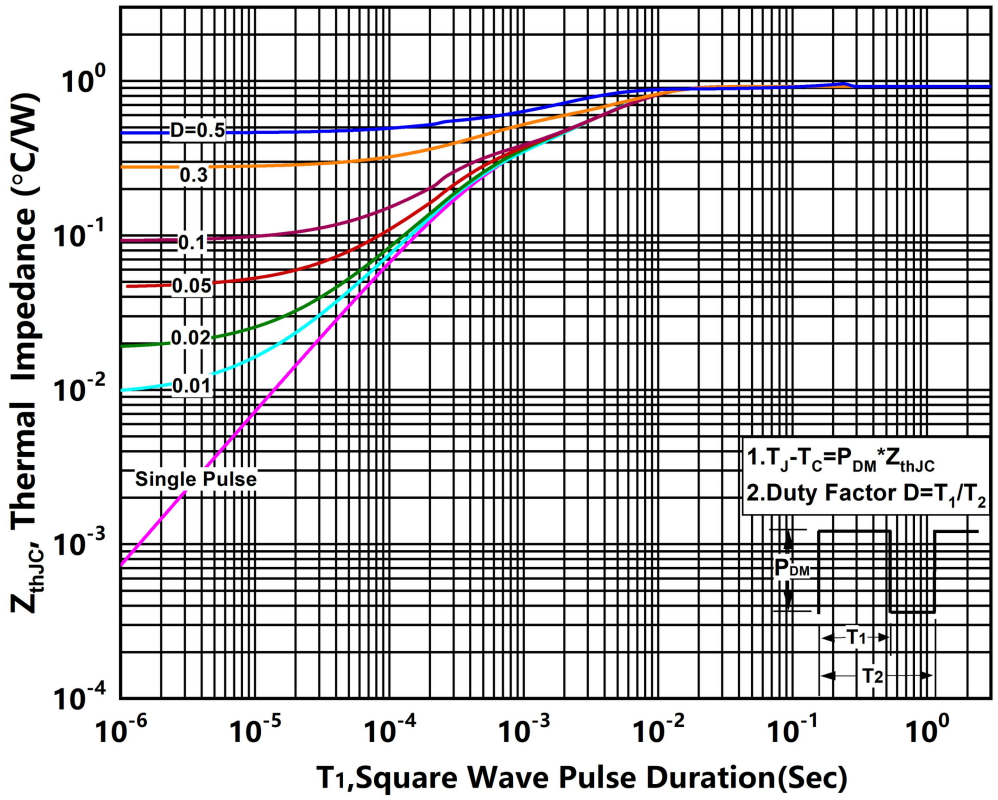
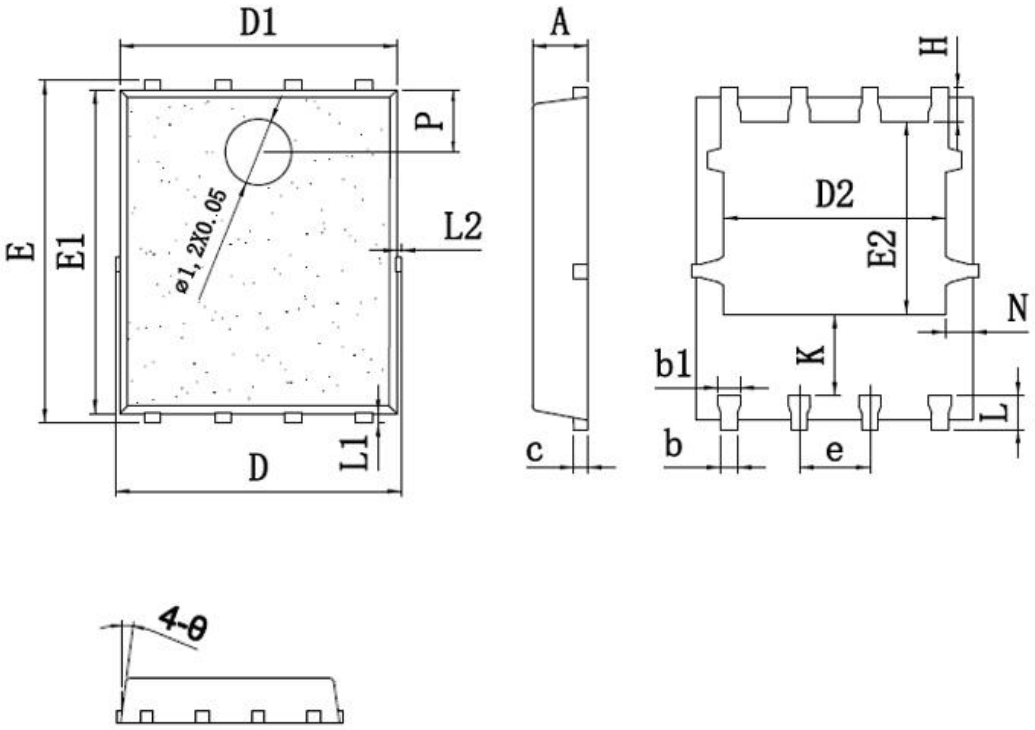


Figure.13 Transient Thermal Impedance (Junction - Case)



Package Outline:PDFN5*6-8L



SYMBOL	mm		
	MIN	NOM	MAX
A	0.95	1.00	1.05
b	0.25	0.30	0.35
b 1	0.30	0.40	0.50
C	0.20	0.25	0.30
D		5.15BSC	
D1	4.90	5.00	5.10
D2	3.90	4.01	4.20
e	1.17	1.27	1.37
E		6.15BSC	
E1	5.75	5.85	5.95
E2	3.35	3.50	3.65
H	0.51	0.61	0.71
K	1.10	1.35	1.50
L	0.51	0.61	0.71
L1	0.06	0.13	0.20
L2	-	-	0.12
N	0.40	0.50	0.60
P	0.95	1.10	1.25
θ	9°	11°	13°